



Daffodil International University  
Faculty of Science & Information Technology  
Department of Computer Science and Engineering  
Midterm Examination, Summer 2025

Course Code: CSE411, Course Title: Artificial Intelligence

Level: 4 Term: 1 Batch: 63

Time: 01:30 Minutes

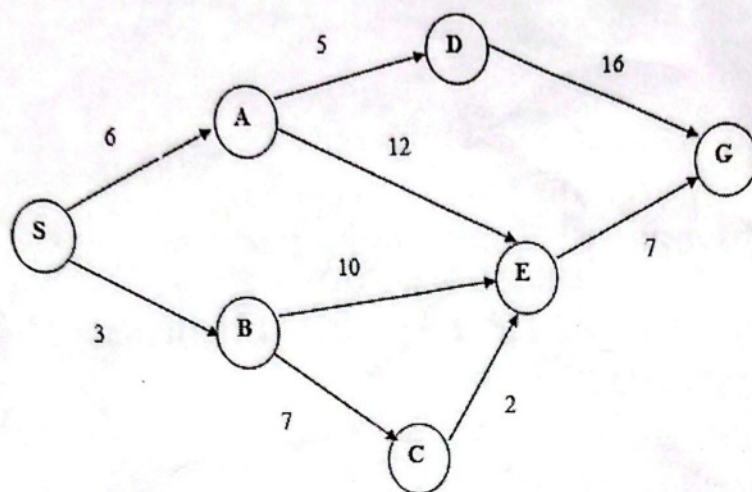
Marks: 25

**Answer ALL Questions**

*[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]*

1.	<p>Imagine a scenario where an agent is trying to eat all the food in a maze that contains obstacles, but he has the help of his friends now! An agent cannot occupy a square that has an obstacle. There are initially <math>k</math> pieces of food (represented by dots), at positions <math>(f_1, \dots, f_k)</math>. There are also <math>n</math> agents at positions <math>(p_1, \dots, p_n)</math>. Initially, all agents start at random locations in the maze. consider a search problem in which all agents move simultaneously; that is, in each step each agent moves into some adjacent position (Direction: N, S, E, or W, or STOP). Note that any number of agents may occupy the same position. Figure 1 represents the problem space overall.</p> <div><table><tr><td>●</td><td>●</td><td>●</td><td>●</td></tr><tr><td></td><td>☺</td><td>●</td><td></td></tr><tr><td></td><td></td><td>●</td><td></td></tr><tr><td></td><td>☺</td><td>●</td><td>☺</td></tr></table><div><div>☺ Agent</div><div>● Food</div></div></div> <p style="text-align: center;">Figure: 1</p>	●	●	●	●		☺	●				●			☺	●	☺	CO1
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a)	Explain the problem for Figure 1.	5																
2.	Consider a state space where the start state is number 1 and each state $k$ has two successors: numbers $2k$ and $2k + 1$ .																	
a)	Construct the portion of the state space for states 1 to 15.	1																
b)	Suppose the goal state is 11. Now <b>Develop</b> the List the order in which nodes will be visited for breadth first search, depth-limited search with limit 3, and iterative deepening search.	3																
c)	<b>Illustrate</b> how to eliminate Local Optima in Hill Climbing Algorithm.	2																
d)	Consider the following graph. <b>Develop</b> solution the optimum path from source node to goal node using A* algorithm for this graph. Is it possible to apply uniform cost search (UCS) on it? Compare the results.	4																





n	h(n)
S	14
A	12
B	11
C	6
D	11
E	4
G	0

Figure: 2

3. a) **Construct** solution for the following initial population, perform the three major operations of the genetic algorithm and maximize the output.

0 1 1 0 0
1 0 1 0 1
0 0 1 1 1
1 1 1 0 0
1 0 0 1 0
0 0 0 1 1

4. A modern e-commerce company is developing an automated warehouse management system using intelligent agents. The system aims to efficiently sort, store, and retrieve packages within a large warehouse. Each package needs to be placed in an optimal storage location, and retrieved promptly when an order comes in. The warehouse environment includes conveyor belts, robotic arms, and a network of sensors providing real-time data on package location, available storage space, and order status. **Illustrate** an expert system where package-sorting robot tools can provide better service.